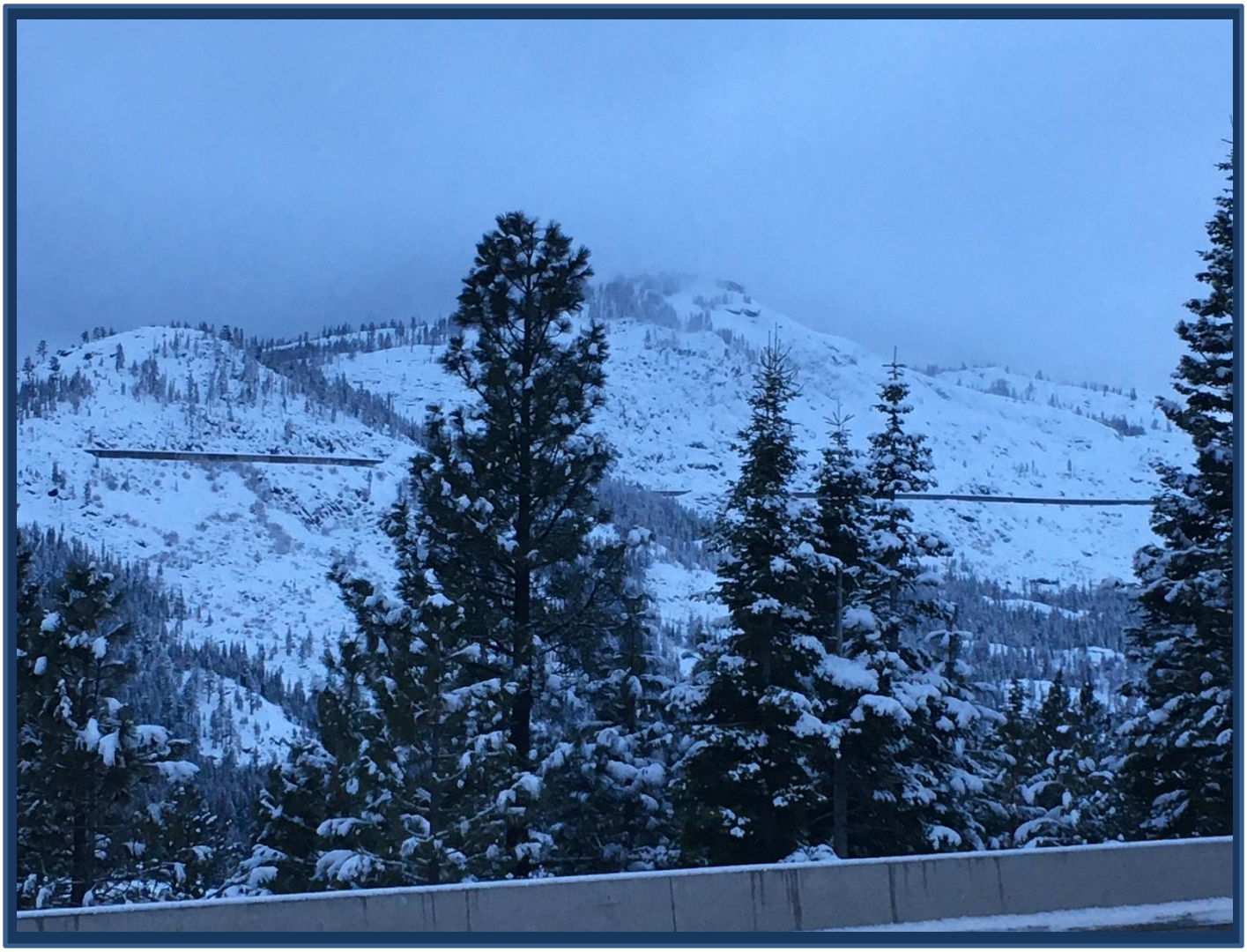
UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

California Water Supply Outlook Report

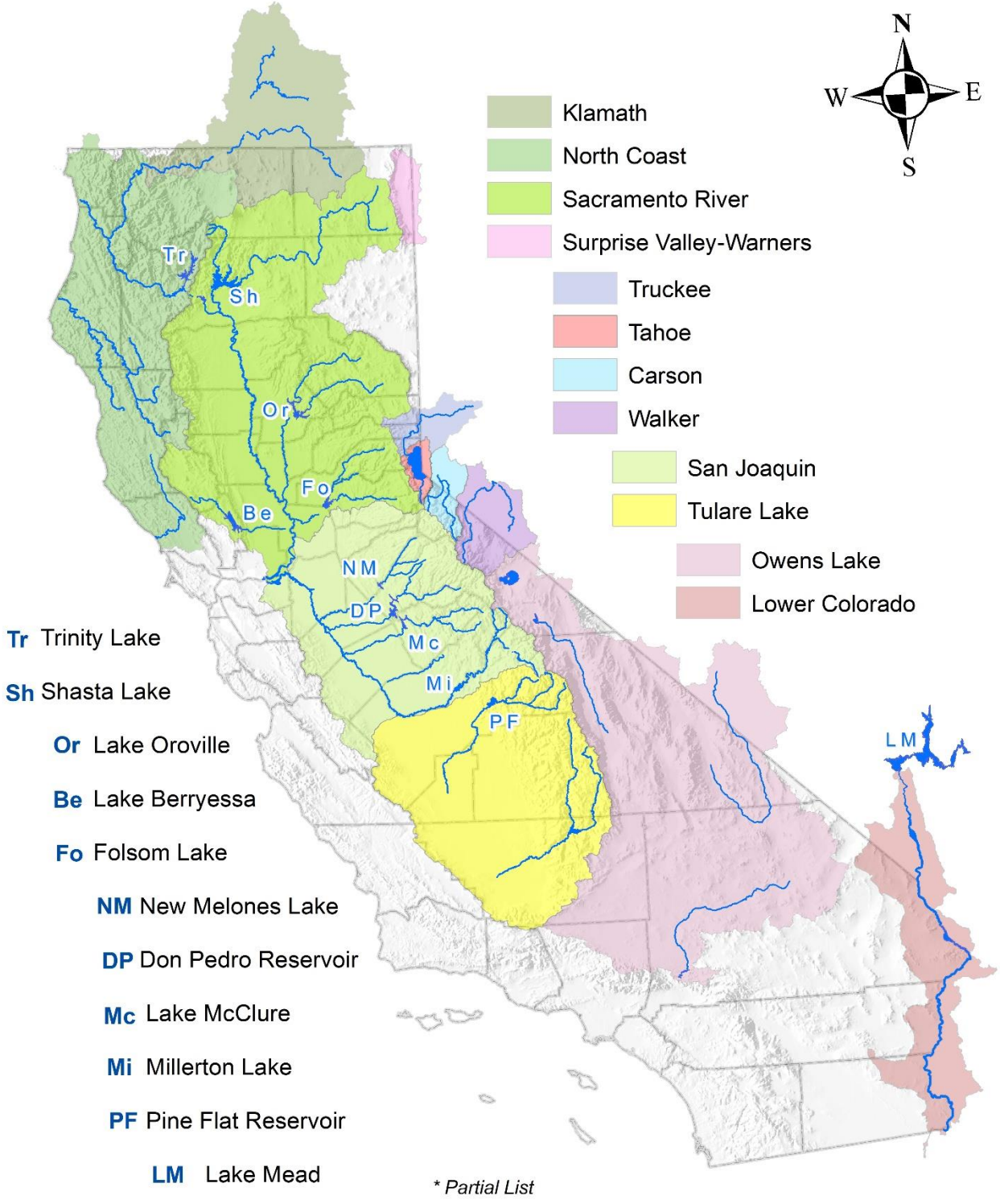
January 1, 2020



Looking south across Donner Lake from Vista Point off westbound Interstate 80. The snow water equivalent averaged for the 30 stations in northern California on December 24, 2019 when this photo was taken, was 91 percent of normal.

Contents

California Forecast Basins, Major Rivers, and Large Reservoirs*



STATE OF CALIFORNIA GENERAL OUTLOOK
January 1, 2020

SUMMARY
After a dry October, storms started sweeping across the state in November, especially in the south. Storm activity expanded northward in December, bumping up the average statewide snow pack from 55 percent at the end of November, to 94 percent by December 31st. Above average precipitation in the Tulare Basin in November and in the Northern Sierras and San Joaquin Basin in December, boosted the totals for the water year through December, to 68-, 75- and 83 percent of average for the north, central, and southern regions, respectively. Total reservoir storage (not including the Colorado River) stood at 114 percent of average on December 31st, compared to 93% of average a year ago.

SNOWPACK
Snow gages in the northern-, central-, and southern mountains recorded snow water equivalents on December 31st that averaged 81-, 94-, and 109 percent of normal for the date, respectively.

More information is available online at http://cdec.water.ca.gov/snow/current/snow/index2.html.

PRECIPITATION
Precipitation in the Northern Sierra (8-Station) region was 3-, 43-, and 106 percent of the monthly averages for October, November, and December, respectively. Equivalent totals in the San Joaquin (5-Station) Basin were 0-, 69-, and 104 percent of normal. After no measured precipitation in October, the Tulare (6-Station) Basin received 106- percent of its monthly average in November, and 89 percent of the monthly average in December.

More information is available online at http://cdec.water.ca.gov/snow_rain.html

RESERVOIRS
Total reservoir storage (excluding Lake Powell and Lake Mead) as of December 31st stood at 114 percent of average, including 96- and 116 percent at Shasta and Pine Flat, respectively. Storage in Lake Mead was 58 percent of the month-end average, with forecast inflows into Lake Powell between April and July estimated at 86 percent of average.

More information is available online at http://cdec.water.ca.gov/snow/reservoir_ss.html.

STREAMFLOW
Forecasts for all regions suggest below average to average streamflows in the coming months: National Weather Service (NWS) forecasts for stations in the Sacramento, San Joaquin, and Tulare basins (Apr-Jul) range between 54- and 98 percent of average. NRCS forecasts for stations in the Tahoe, Truckee, Carson, and Walker River basins (for periods staring in March) range between 72- and 103 percent of average. NRCS- and NWS forecasts for stations in the Klamath Basin (Jan-Jul/Sep) and the North Coast (Apr-Jul) range between 62- and 79 percent of average. Summaries are provided below.

Sacramento River Basin

National Weather Service (NWS) streamflow forecasts at 12 sites range between 66- and 98 percent of average between April and July (APR-JUL).

California Streamflow Forecast Summary: January 1, 2020
(Averages based on 1981-2010 reference period)

SACRAMENTO RIVER BASIN	Forecast Period	Forecast Exceedance Probabilities for Risk Assessment: Chance that actual volume will exceed forecast — 90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Sacramento R at Shasta (NWS)	APR-JUL	138	191	260	**83%**	390	470	312.2
McCloud R ab Shasta (NWS)	APR-JUL	194	240	295	**78%**	385	435	379
Pit R at Shasta Lk (NWS)	APR-JUL	530	595	730	**72%**	,890	1,090	1,013.2
Inflow to Shasta Lk (NWS)	APR-JUL	1,020	1,200	1,450	**80%**	1,900	2,320	1,802.7
Sacramento R nr Red Bluff (NWS)	APR-JUL	1,410	1,700	2,050	**83%**	2,730	3,350	2,479.3
NF Feather R nr Prattville (NWS)	APR-JUL	138	170	220	**66%**	280	340	333.4
Inflow to Oroville Res (NWS)	APR-JUL	690	910	1,420	**83%**	1,910	2,680	1,700.7
Yuba R at Smartville (NWS)	APR-JUL	430	555	840	**86%**	1,180	1,460	981.1
MF American R nr Auburn (NWS)	APR-JUL	125	158	250	**91%**	320	387	273.4
Inflow to Union Valley Res (NWS)	APR-JUL	43	61	90	**92%**	116	152	98
Silver Ck bl Camino Div. Dam (NWS)	APR-JUL	77	103	154	**98%**	198	265	157.6
Inflow to Folsom Res (NWS)	APR-JUL	480	645	1,000	**81%**	1,420	1,920	1,231.6

1) 90% and 10% exceedance probabilities are actually 95% and 5%
2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions

San Joaquin River Basin

National Weather Service (NWS) streamflow forecasts at eight sites range between 59- and 90 percent of average between April and July (APR-JUL).

California Streamflow Forecast Summary: January 1, 2020
(Averages based on 1981-2010 reference period)

SAN JOAQUIN RIVER BASIN	Forecast Period	Forecast Exceedance Probabilities for Risk Assessment: Chance that actual volume will exceed forecast — 90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Cosumnes R at Michigan Bar (NWS)	APR-JUL	28	41	76	**59%**	146	245	128.4
Inflow to Pardee Res (NWS)	APR-JUL	215	290	420	**90%**	595	775	466.6
Inflow to New Melones Res (NWS)	APR-JUL	275	405	620	**90%**	860	1,120	690.2
Tuolumne R nr Hetch Hetchy (NWS)	APR-JUL	265	340	495	**83%**	645	760	595.8
Inflow to New Don Pedro Res (NWS)	APR-JUL	505	685	1,020	**83%**	1,430	1,730	1,228.3
Merced R at Pohono Bridge Yosemite (NWS)	APR-JUL	146	193	320	**83%**	435	525	384.1
Inflow to Lake McClure (NWS)	APR-JUL	195	280	490	**76%**	715	960	642.3
Inflow to Millerton Lk (NWS)	APR-JUL	430	580	925	**74%**	1,450	1,840	1,257.7

1) 90% and 10% exceedance probabilities are actually 95% and 5%
2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions

Tulare Lake Basin

National Weather Service (NWS) streamflow forecasts at four sites range between 54- and 87 percent of average between April and July (APR-JUL).

California Streamflow Forecast Summary:
January 1, 2020
(Averages based on 1981-2010 reference period)

TULARE LAKE BASIN	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
		Forecast Exceedance Probabilities for Risk Assessment Chance that actual volume will exceed forecast						
Inflow to Pine Flat Res (NWS)	APR-JUL	555	705	1,070	**87%**	1,490	1,900	1,231
Kaweah R at Terminus Res (NWS)	APR-JUL	111	161	245	**85%**	385	495	287.9
Tule R at Success Res (NWS)	APR-JUL	12	18	34	**54%**	68	96	63.3
Inflow to Isabella Res (NWS)	APR-JUL	161	210	340	**75%**	560	750	454.4

1) 90% and 10% exceedance probabilities are actually 95% and 5%
2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions

North Coastal Area Basin

The National Weather Service's (NWS') APR-JUL streamflow forecasts at Clair Engle Lake and Scott River are 79- and 70 percent of average, respectively.

California Streamflow Forecast Summary:
January 1, 2020
(Averages based on 1981-2010 reference period)

NORTH COASTAL AREA	Forecast Period	Forecast Exceedance Probabilities for Risk Assessment: Chance that actual volume will exceed forecast — 90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Inflow to Clair Engle Lk (NWS)								
	APR-JUL	285	385	525	**79%**	720	860	666.1
Scott R nr Fort Jones (NWS)								
	APR-JUL	55	80	121	**70%**	165	220	172.9

1) 90% and 10% exceedance probabilities are actually 95% and 5%
2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions

Klamath Basin

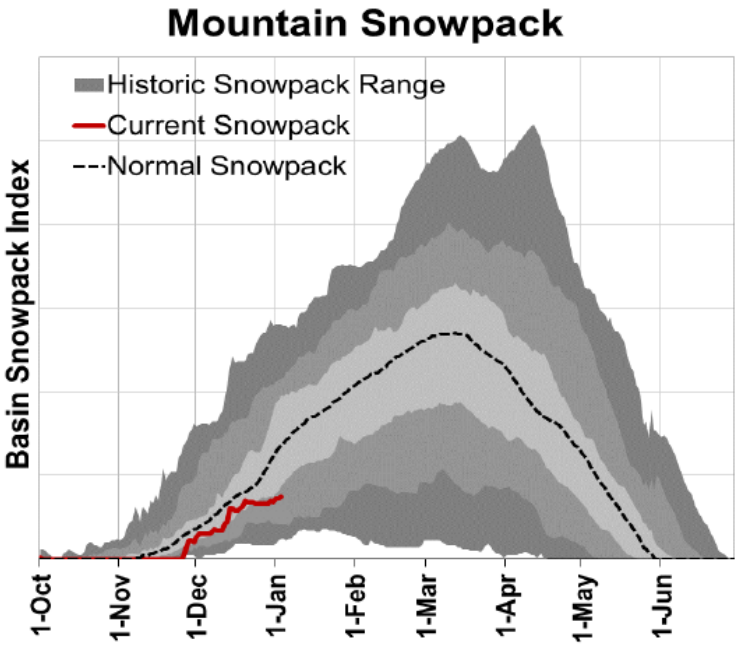
Including information from the Water Supply Outlook Report for Oregon
(https://www.wcc.nrcs.usda.gov/ftpref/states/or/watersupply/2020/WSOR_2020_Jan.pdf):

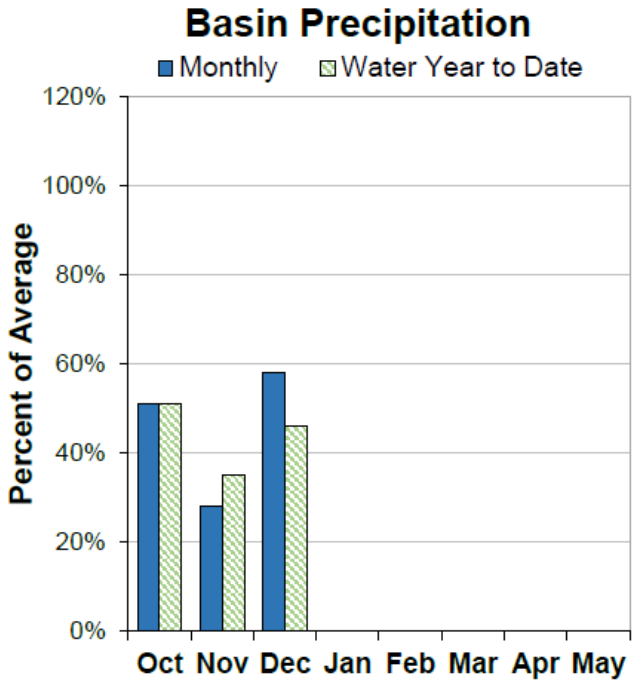
As of January 1, the basin snowpack was 53% of normal. This is lower than last year when the basin snowpack was 74% of normal on January 1, 2019.

December precipitation was 58% of average. Precipitation since the beginning of the water year (October 1 - January 1) has been 46% of average.

As of January 1, storage at major reservoirs in the basin ranges from 73% of average at Upper Klamath Lake to 151% of average at Gerber Reservoir.

The January through September (JAN-SEP) streamflow forecasts in the basin range from 62 percent to 73 percent of average.





Klamath Basin (cont'd)

California Streamflow Forecast Summary: January 1, 2020
(Averages based on 1981-2010 reference period)

Forecast Exceedance Probabilities for Risk Assessment
Chance that actual volume will exceed forecast

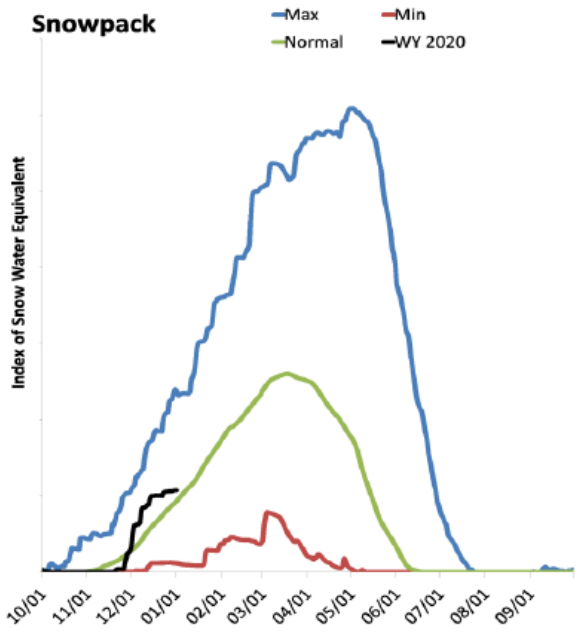
KLAMATH BASIN	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Gerber Reservoir Inflow[2]								
	JAN-JUL	2	13.1	29	**62%**	45	69	47
	APR-SEP	0	1.8	8	**56%**	15.3	26	14.4
Sprague R nr Chiloquin								
	JAN-SEP	100	166	220	**62%**	280	385	355
	MAR-SEP	74	127	171	**62%**	220	310	275
Williamson R bl Sprague R nr Chiloquin								
	JAN-SEP	187	320	415	**70%**	505	640	595
	MAR-SEP	141	250	320	**70%**	390	500	460
Upper Klamath Lake Inflow[1]								
	JAN-SEP	345	570	690	**73%**	820	1,150	940
	MAR-SEP	205	365	450	**70%**	550	795	645

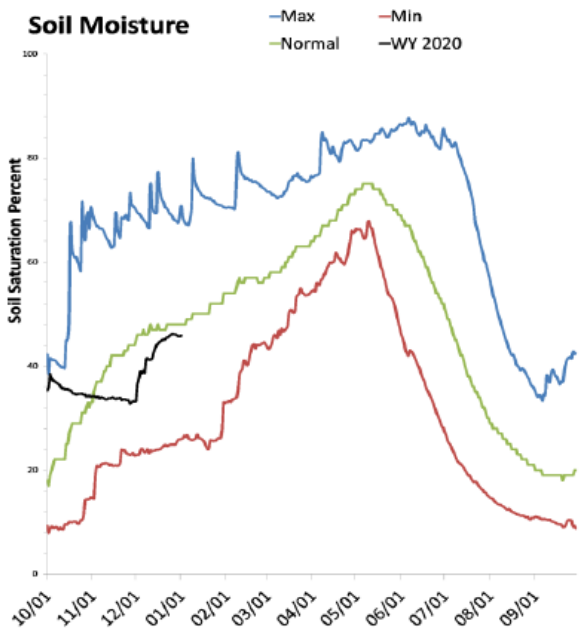
1) 90% and 10% exceedance probabilities are actually 95% and 5%
2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions

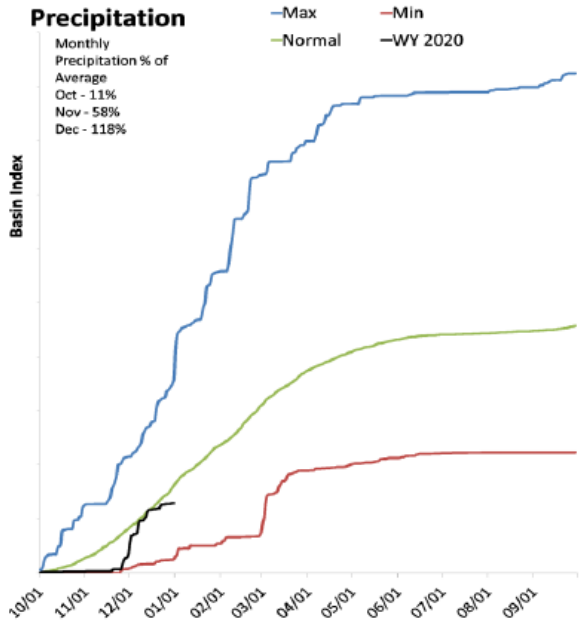
Lake Tahoe Basin

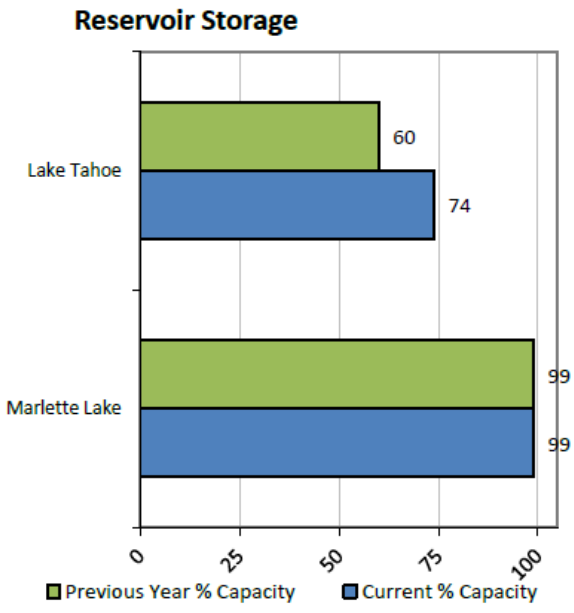
From the Water Supply Outlook Report for Nevada
(https://www.nrcs.usda.gov/wps/portal/nrcs/main/nv/snow/):

Snowpack in the Lake Tahoe Basin is above normal at 116% of median, compared to 76% last year. Precipitation in December was above average, which brings the seasonal accumulation (Oct-Dec) to 80% of average. Soil moisture is at 46% saturation, compared to 48% last year. Lake Tahoe's water elevation is 6227.51 ft, which is 4.51 ft above the lake's natural rim and equals a storage of 549.2 thousand acre-feet. Last year its elevation was 6226.68 ft which equaled a storage of 447.8 thousand acre-feet. Lake Tahoe should fill to its legal limit of 6,229.1 ft this summer based on the current lake rise forecasts.









Lake Tahoe Basin (cont'd)

California Streamflow Forecast Summary: January 1, 2020
(Averages based on 1981-2010 reference period)

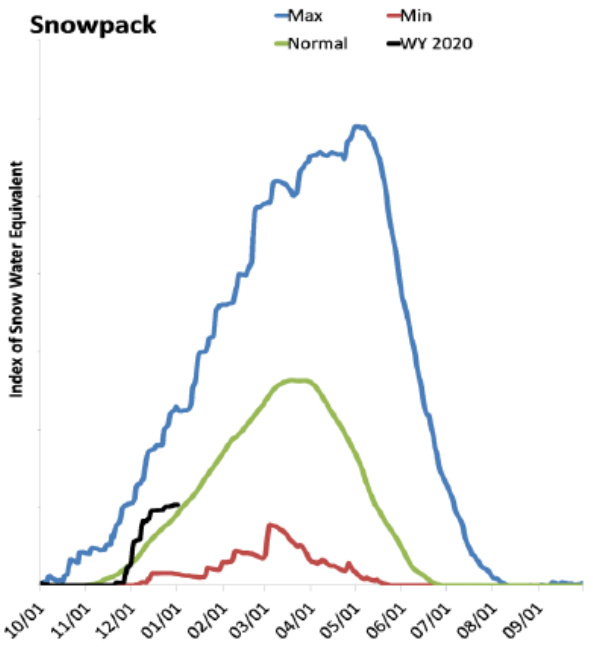
LAKE TAHOE BASIN	Forecast Period	Forecast Exceedance Probabilities for Risk Assessment: Chance that actual volume will exceed forecast — 90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Marlette Lake Inflow								
	MAR-JUL	-60	660	1,140	**103%**	1,630	2,400	1,110
	APR-JUL	-220	420	840	**101%**	1,280	1,910	830
Lake Tahoe Rise Gates Closed[1]								
	OCT-HIGH	0.29	1.19	2	**89%**	2.8	4.6	2.24
	MAR-HIGH	0.463	1.245	1.6	**92%**	1.955	2.7	1.73
	APR-HIGH	0.35	0.7	1.1	**84%**	1.35	1.9	1.31

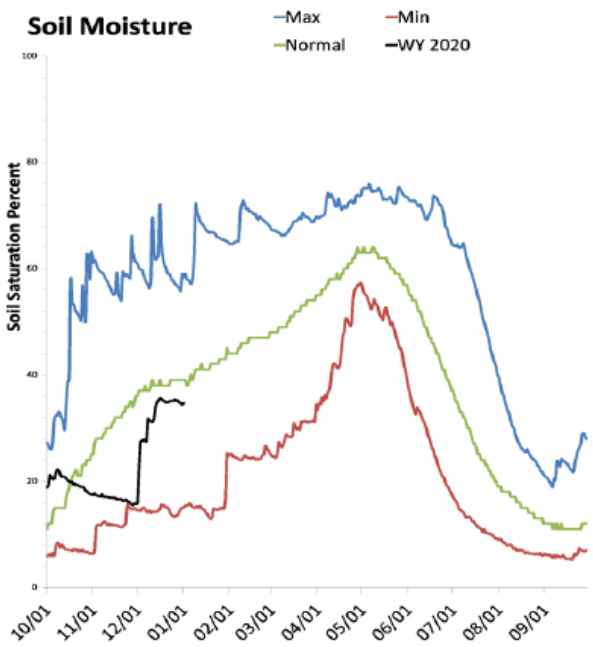
1) 90% and 10% exceedance probabilities are actually 95% and 5%
2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions

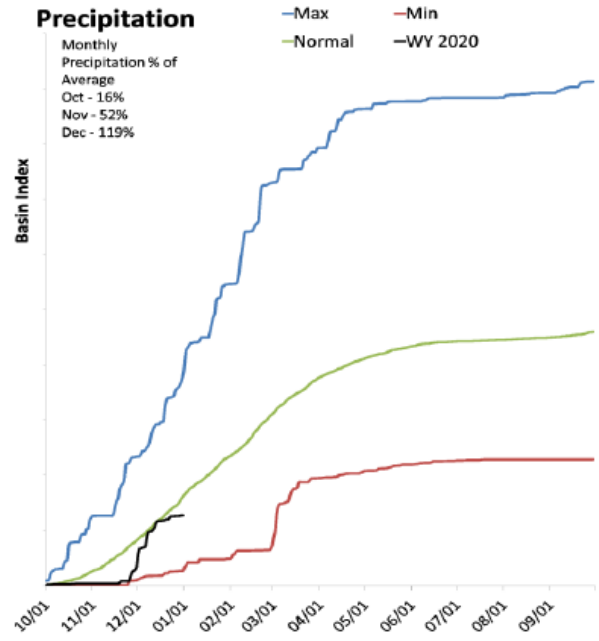
Truckee River Basin

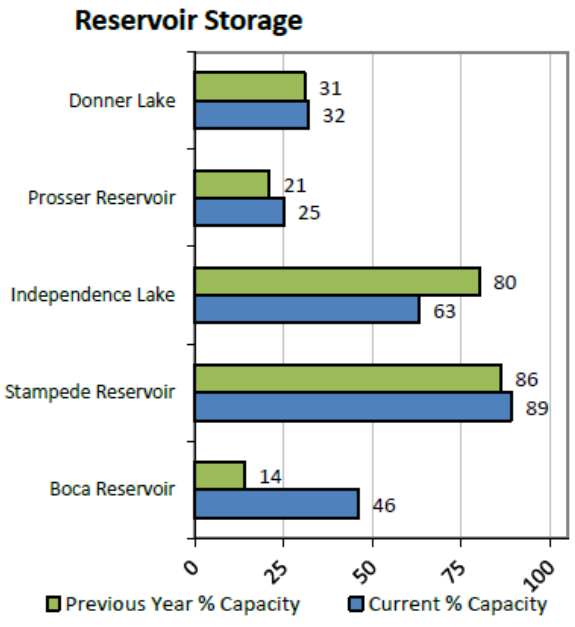
Including information from the Water Supply Outlook Report for Nevada
(https://www.nrcs.usda.gov/wps/portal/nrcs/main/nv/snow/):

Snowpack in the Truckee River Basin is above normal at 110% of median, compared to 71% last year. Precipitation in December was above average, which brings the seasonal accumulation (Oct-Dec) to 79% of average. Soil moisture is at 35% saturation, compared to 32% last year. Combined reservoir storage is 75% of capacity , compared to 69% last year. Forecast streamflow volumes between March and July (MAR-JUL) range from 72- to 94 percent of average.









Truckee River Basin (cont'd)

California Streamflow Forecast Summary:
January 1, 2020
(Averages based on 1981-2010 reference period)

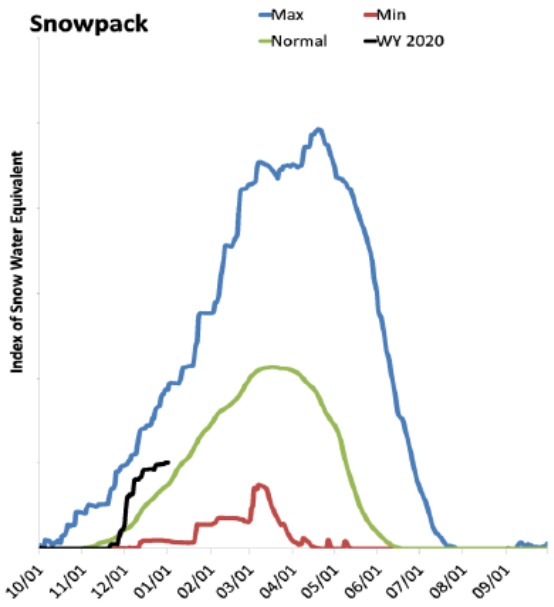
TRUCKEE RIVER BASIN	Forecast Period	Forecast Exceedance Probabilities for Risk Assessment Chance that actual volume will exceed forecast 90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Sagehen Ck nr Truckee								
	MAR-JUL	2.2	3.4	4.6	**72%**	6.2	9.4	6.4
	APR-JUL	1.89	3	4	**71%**	5.4	8.5	5.6
L Truckee R ab Boca Reservoir[2]								
	MAR-JUL	17.5	64	95	**89%**	126	172	107
	APR-JUL	20	36	78	**89%**	95	140	88
Truckee R at Farad[2]								
	MAR-JUL	78	205	290	**94%**	375	500	307
	APR-JUL	85	145	240	**94%**	315	380	255

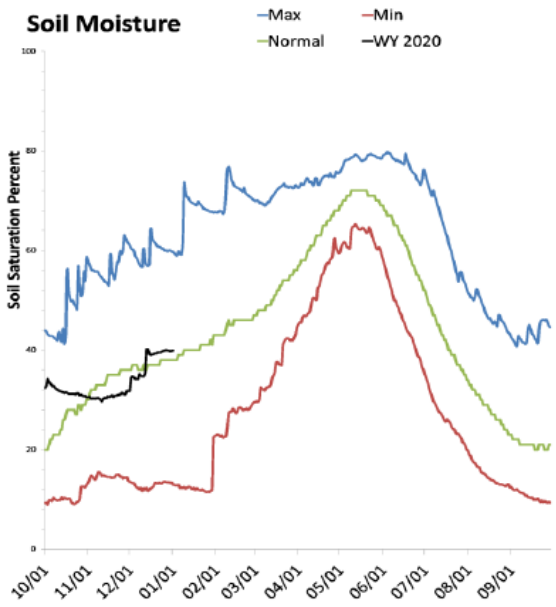
1) 90% and 10% exceedance probabilities are actually 95% and 5%
2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions

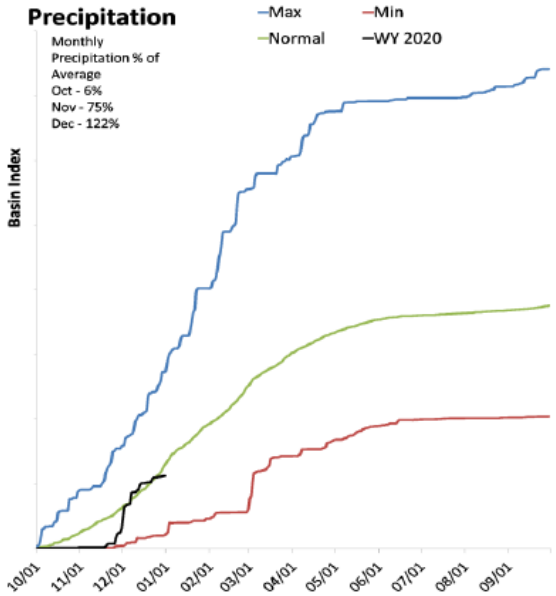
Carson River Basin

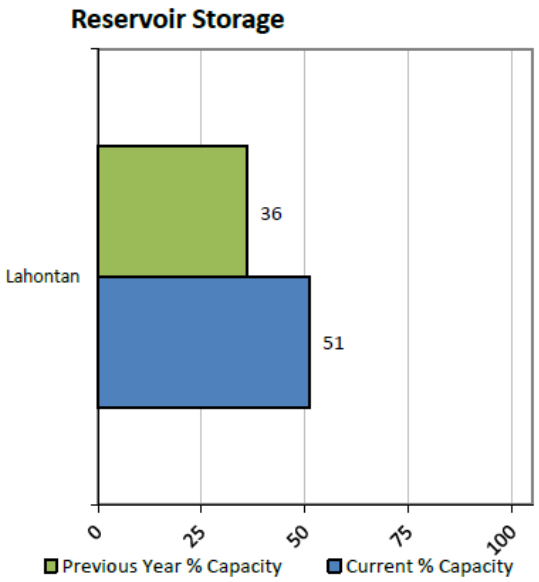
Including information from the Water Supply Outlook Report for Nevada
(https://www.nrcs.usda.gov/wps/portal/nrcs/main/nv/snow/):

Snowpack in the Carson River Basin is much above normal at 135% of median, compared to 94% last year. Precipitation in December was above average, which brings the seasonal accumulation (Oct-Dec) to 87% of average. Soil moisture is at 40% saturation, compared to 34% last year. Storage in Lahontan Reservoir is 51% of capacity, compared to 36% last year. Forecast streamflow volumes for the East- and West Forks of the Carson River (March through July) are 93- and 100 percent of average, respectively.









Carson River Basin (cont'd)

California Streamflow Forecast Summary:
January 1, 2020
(Averages based on 1981-2010 reference period)

CARSON RIVER BASIN	Forecast Period	Forecast Exceedance Probabilities for Risk Assessment: Chance that actual volume will exceed forecast — 90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
EF Carson R nr Gardnerville								
	MAR-JUL	57	137	191	**93%**	245	325	205
	APR-JUL	40	122	177	**95%**	230	315	186
	200 cfs	13 Jun	04 Jul	18 Jul		01 Aug	22 Aug	25 Jul
	500 cfs	25 May	13 Jun	26 Jun		09 Jul	28 Jul	01 Jul
WF Carson R nr Woodfords								
	MAR-JUL	16	42	59	**100%**	77	103	59
	APR-JUL	13.1	37	54	**100%**	71	95	54

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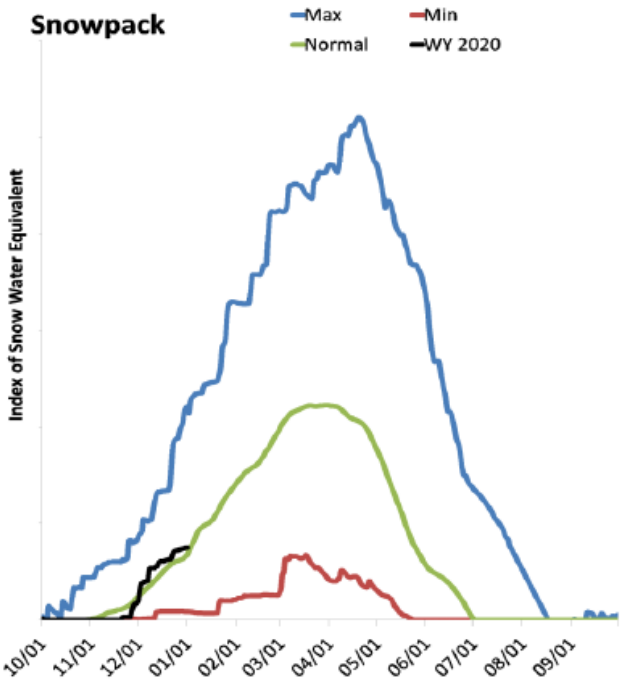
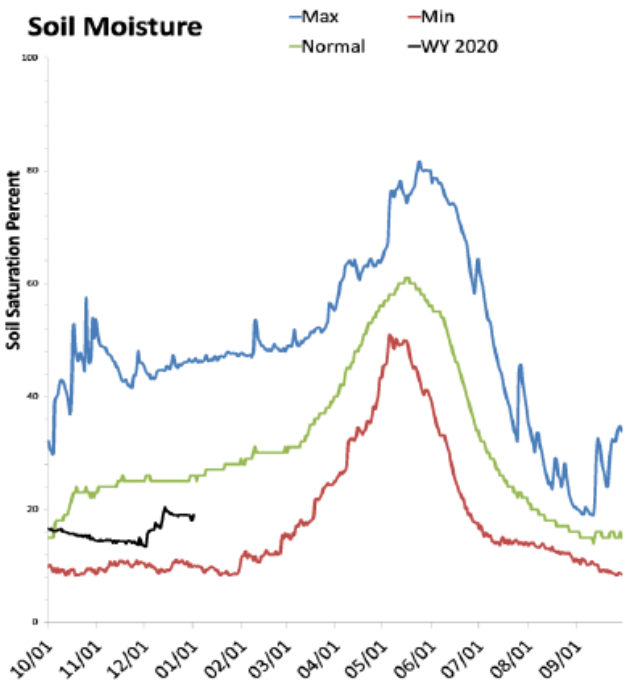
2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions

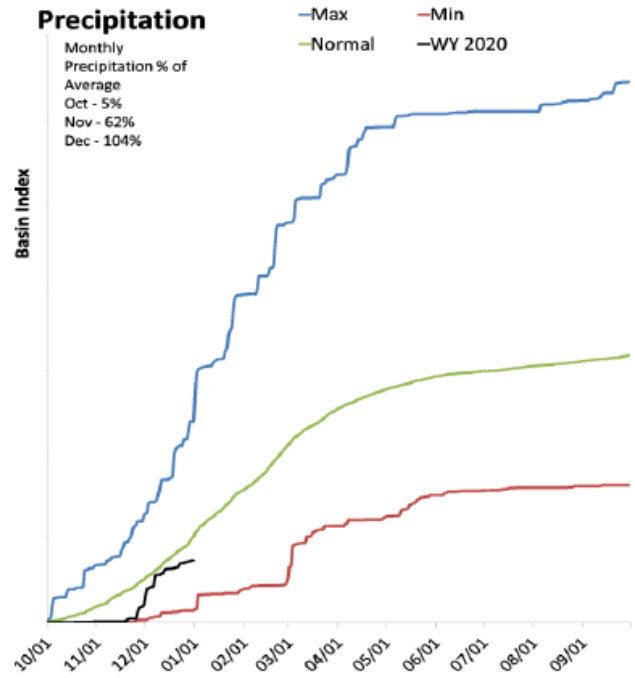
Walker River Basin

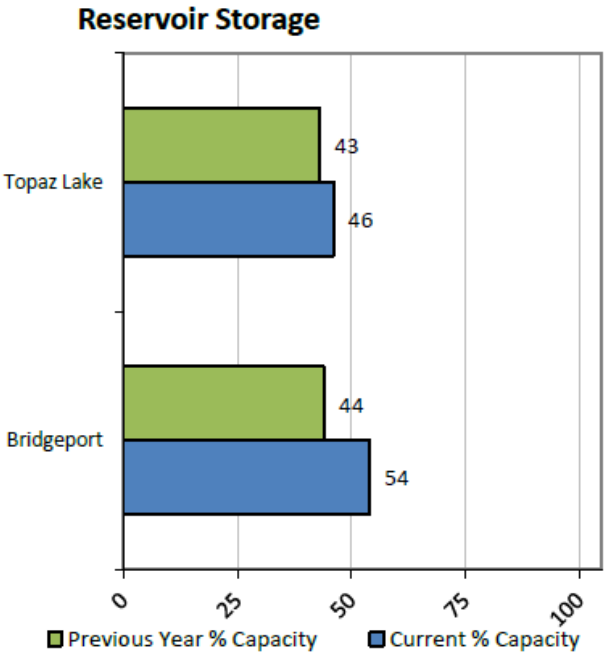
Including information from the Water Supply Outlook Report for Nevada (https://www.nrcs.usda.gov/wps/portal/nrcs/main/nv/snow/):

Snowpack in the Walker River Basin is above normal at 111% of median, compared to 92% last year. Precipitation in December was near average, which brings the seasonal accumulation (Oct-Dec) to 73% of average. Soil moisture is at 19% saturation, compared to 20% last year. Combined reservoir storage is 49% of capacity, compared to 43% last year. Forecast streamflow volumes range between 86- and 100 percent of average.









Walker River Basin (cont'd)

California Streamflow Forecast Summary:
January 1, 2020
(Averages based on 1981-2010 reference period)

		Forecast Exceedance Probabilities for Risk Assessment Chance that actual volume will exceed forecast						
WALKER RIVER BASIN	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	**% Avg**	30% (KAF)	10% (KAF)	30yr Avg (KAF)
E Walker R nr Bridgeport								
	MAR-AUG	7.7	43	67	**86%**	90	126	78
	APR-AUG	9.7	41	61	**90%**	82	113	68
W Walker R bl L Walker nr Coalville								
	MAR-JUL	63	127	170	**100%**	215	275	170
	APR-JUL	56	118	160	**99%**	200	265	162
W Walker R nr Coalville								
	MAR-JUL	64	128	171	**99%**	215	275	172
	APR-JUL	67	122	160	**98%**	198	255	163

1) 90% and 10% exceedance probabilities are actually 95% and 5%
2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions

Owens River Basin

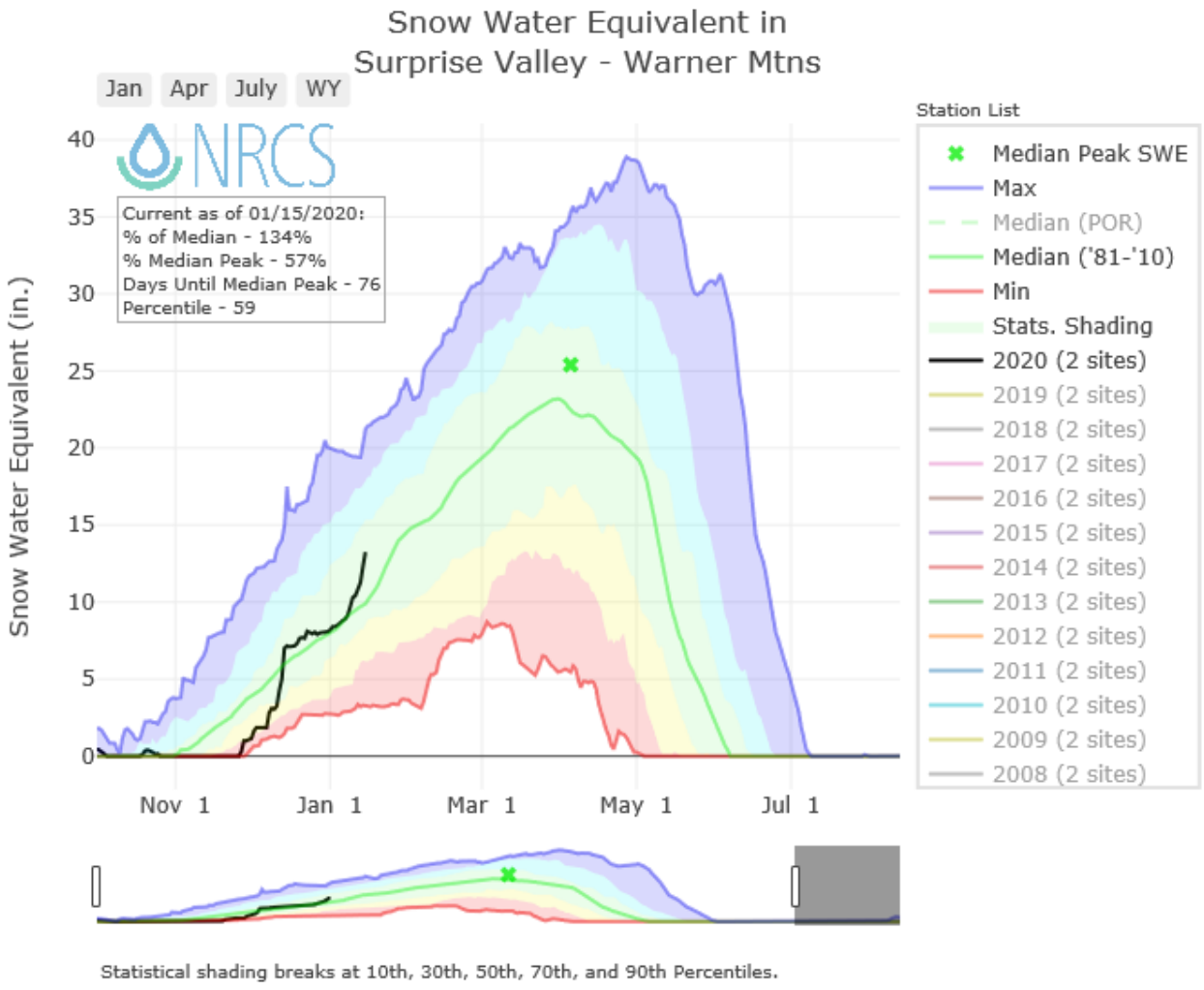
No report for January

Surprise Valley

From the Water Supply Outlook Report for Nevada and at

https://www.nrcs.usda.gov/Internet/WCIS/basinCharts/POR/WTEQ/NV_CA/Surprise%20Valley%20-%20Warner%20Mtns.html):

On January 1, snowpack measured at the two SNOTEL sites in Surprise Valley-Warner Mountains averaged 103 percent of median, compared to 113 percent last year. As shown below, the measured snowpack increased to 134 percent by January 15.



Lower Colorado River Basin

Including information from the Water Supply Outlook Report for Nevada
(https://www.nrcs.usda.gov/wps/portal/nrcs/main/nv/snow/):

As of January 1, 2020, storage in Lake Mead was at 42 percent of capacity, up 780 thousand acre-feet (KAF) from this time last year. Snowpack in the Colorado River Basin above Glen Canyon Dam was 118 percent of the median, compared to 92 percent last year. The forecast unimpaired streamflow volume for Lake Powell Inflow is 86 percent of average for April through July. Note that the actual flow will be dependent on upstream reservoir management and diversions.

Reservoir Storage End of December, 2019	Current (KAF)	Last Year (KAF)	Average (KAF)	Capacity (KAF)
Lake Mead	10912.0	10132.0	20297.0	26159.0
Lake Mohave	1634.0	1634.0	1602.0	1810.0
Basin-wide Total	12546.0	11766.0	21899.0	27969.0
# of reservoirs	2	2	2	2

Watershed Snowpack Analysis January 1, 2020	# of Sites	% Median	Last Year % Median
Spring Mountains	0		
White River	1	102%	54%
Virgin River	8	224%	78%
Colorado R above Glen Canyon Dam	105	118%	92%

California Streamflow Forecast Summary: January 1, 2020
(Averages based on 1981-2010 reference period)

		Forecast Exceedance Probabilities for Risk Assessment Chance that actual volume will exceed forecast						
COLORADO RIVER BASIN	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	**% Avg**	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Lake Powell Inflow [2]	APR-JUL	2,970	4,720	6,150	**86%**	7,760	10,500	7,160

1) 90% and 10% exceedance probabilities are actually 95% and 5%
2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions

How forecasts are made

Most of the annual streamflow in the western United States originates as snowfall that has accumulated in the mountains during the winter and early spring. As the snowpack accumulates, hydrologists estimate the runoff that will occur when it melts. Measurements of snow water equivalent at selected manual snowcourses and automated SNOTEL sites, along with precipitation, antecedent streamflow, and indices of the El Niño / Southern Oscillation are used in computerized statistical and simulation models to prepare runoff forecasts. These forecasts are coordinated between hydrologists in the Natural Resources Conservation Service and the National Weather Service. Unless otherwise specified, all forecasts are for flows that would occur naturally without any upstream influences.

Forecasts of any kind, of course, are not perfect. Streamflow forecast uncertainty arises from three primary sources: (1) uncertain knowledge of future weather conditions, (2) uncertainty in the forecasting procedure, and (3) errors in the data. The forecast, therefore, must be interpreted not as a single value but rather as a range of values with specific probabilities of occurrence. The middle of the range is expressed by the 50% exceedance probability forecast, for which there is a 50% chance that the actual flow will be above, and a 50% chance that the actual flow will be below, this value. To describe the expected range around this 50% value, four other forecasts are provided, two smaller values (90% and 70% exceedance probability) and two larger values (30%, and 10% exceedance probability). For example, there is a 90% chance that the actual flow will be more than the 90% exceedance probability forecast. The others can be interpreted similarly.

The wider the spread among these values, the more uncertain the forecast. As the season progresses, forecasts become more accurate, primarily because a greater portion of the future weather conditions become known; this is reflected by a narrowing of the range around the 50% exceedance probability forecast. Users should take this uncertainty into consideration when making operational decisions by selecting forecasts corresponding to the level of risk they are willing to assume about the amount of water to be expected. If users anticipate receiving a lesser supply of water, or if they wish to increase their chances of having an adequate supply of water for their operations, they may want to base their decisions on the 90% or 70% exceedance probability forecasts, or something in between. On the other hand, if users are concerned about receiving too much water (for example, threat of flooding), they may want to base their decisions on the 30% or 10% exceedance probability forecasts, or something in between. Regardless of the forecast value users choose for operations, they should be prepared to deal with either more or less water. (Users should remember that even if the 90% exceedance probability forecast is used, there is still a 10% chance of receiving less than this amount.) By using the exceedance probability information, users can easily determine the chances of receiving more or less water.

This publication is posted with other Water Supply Outlook Reports for California at:
https://www.nrcs.usda.gov/wps/portal/nrcs/detail/ca/snow/.

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